

REMARKS

With careful attention to the Examiner's comments in the Office Action, the Application has been amended to place it in condition for allowance. The remarks presented herein are believed to be fully responsive to the Office Action.

Claims 1-13 are pending in the present application. Applicant is amending claims 1, 2 and 10. The independent claim recited by the present application is claim 1.

CLAIM REJECTIONS:

Claim Rejections under 35 U.S.C. § 103

LEGAL PRINCIPLE - To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves, or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all claim limitations. The teaching or suggestion to make the claim combination or combine the references and the reasonable expectation of success must both be found in the prior art and not based on the Applicant's disclosure. In re Vaeck, 947 F.2d 488 (Fed. Cir. 1991).

With regard to the first criteria for a suggestion or motivation to modify or combine references, obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. The test for an implicit showing

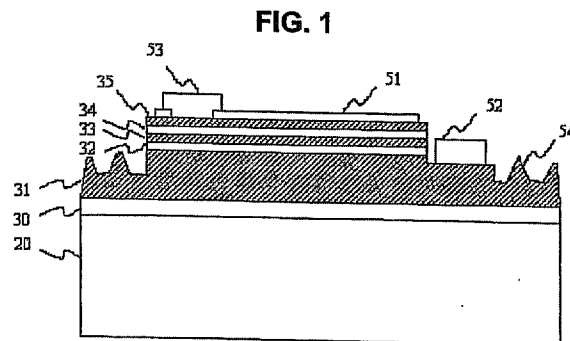
is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art. In re Kotzab, 217 F.3d 1368 (Fed. Cir. 2000). Courts and patent examiners should determine whether needs or problems known in the field and addressed by the prior art references can provide a reason for combining the elements in the manner claimed. KSR Intern. Co. v. Teleflex Inc., No. 04-1350, 2007 WL 1237837, at 4 (Apr. 30, 2007). “In formulating a rejection under 35 USC § 103(a) based upon a combination of prior art elements, it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed.” Memo on KSR Decision to Examiners issued by the United States Patent and Trademark Office, May 4, 2007. According to MPEP § 2141, in the case of a claim to a combination, applicants may submit evidence or argument to demonstrate that: (A) one of ordinary skill in the art could not have combined the claimed elements by known methods (e.g., due to technological difficulties); (B) the elements in combination do not merely perform the function that each element performs separately; or (C) the results of the claimed combination were unexpected. The prior art is not sufficient to establish obviousness without some objective reason to combine the teachings of the references. In re Kotzab, 217 F.3d 1368 (Fed. Cir. 2000), also see In re Sang Su Lee, 277 F.3d 1338 (Fed. Cir. 2002).

Claim 1

The Office Action further states that claims 1-13 stand rejected under 35 U.S.C. 103(a), as being unpatentable over US Pat. Pub. No. 2004/0013148 (hereinafter "Kwak et al.") in view of US Patent No. 6,379,985 invented by Cervantes et al. (hereinafter "Cervantes et al.").

Applicants respectfully traverse these rejections because the Examiner's characterization of Cervantes et al. is incorrect. Kwak et al. fails to disclose the limitations recited in the independent claim 1 of the present application, and Cervantes et al. still fails to remedy the deficiencies of Kwak et al. in reaching all the elements and limitations of the claims of the present invention.

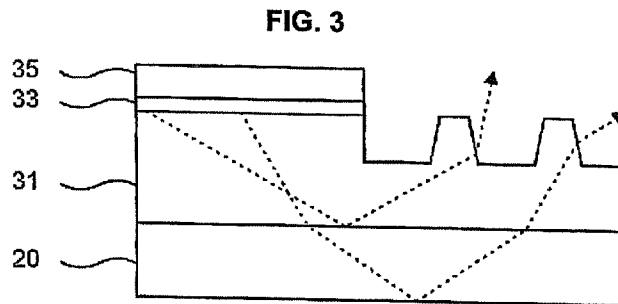
In a light emitting diode ("LED"), unlike a laser diode ("LD"), light generated inside a semiconductor cannot escape from the semiconductor if it is totally internally reflected at the semiconductor-air interface. If the angle of incidence of a light ray is closed to normal incidence, light can escape from the semiconductor. LED uses a rough surface for scattering light to improve external quantum efficiency while LD does not scatter light, but resonate light. Thus, the LD needs no rough surface for scattering or enhancing external quantum efficiency.



As illustrated in the above Fig. 1 and specification of the present application, the present invention relates to a light emitting device with roughened surface or protrusion (i.e. 54 in Fig.1) which functions to help light generated in the active layer 33 escape from the device for enhancing external quantum efficiency.

Generally, once the light-emitting device is completed, a scribing/breaking process is performed in order to package the light-emitting device from a wafer. For the purpose of the

scribing/breaking process, a region for scribing and breaking the device is set between neighboring devices. The present invention allows roughened surface or protrusions 54 to be formed in the region for scribing and breaking the device.



As illustrated in the above Fig. 3, light escapes outwardly effectively since protrusions and depressions are formed in the edge portion.

As indicated in the Office Action (pg. 3), Kwak et al. does not teach or suggest the elements of "the exposed top surface includes a region for scribing and breaking the device and a region for contact with the n-type electrode, and **a top surface of the region for scribing and breaking the device including a roughened surface such that light generated from the active layer escapes outwardly from the device through said roughened surface.**"

The Office Action asserts that Cervantes et al. teaches or suggests the exposed surface including a region for scribing and breaking the device and a region for contact with the n-type electrode, and the surface of the region for scribing and breaking the device is roughened in Kwak's device the motivation for the substitution is to provide methods of cleaving II-V nitride films on c-face sapphire substrates and for forming facets on substrates. (for example, col. 4 lines 52-55 and col. 2 lines 25-33).

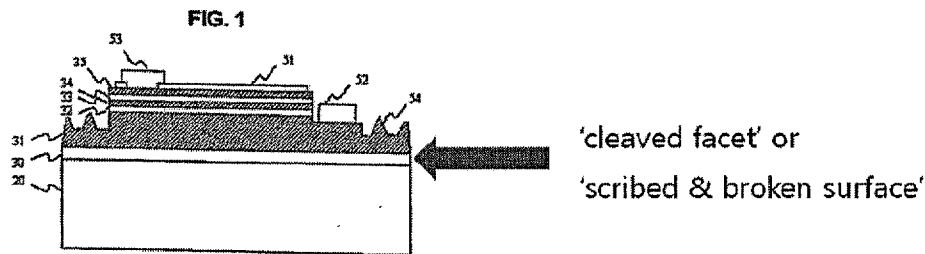
To the contrary, Cervantes et al. does not teach or suggest "a top surface of the region for scribing and breaking the device including a roughened surface such that light generated from

the active layer escapes outwardly from the device through said roughened surface" of the claimed invention.

Cervantes et al. discloses a method for forming facets for light-emitting devices comprising III-V nitride films grown on c-face sapphire substrates and a method for cleaving facets for light-emitting devices comprising such III-V nitride films, formed on c-face sapphire substrates. As discussed above and illustrated in Col. 1, lines 35 - 50 of Cervantes et al., diode laser devices, unlike an LED, include a resonator cavity having opposed mirror surfaces. When electricity passes through the device, photons are produced, which bounce back and forth inside the resonator cavity. The photons move together in phase and at the same wavelength in the resonator cavity, which increases the light intensity. The emitted light forms a narrow column of bright light at a single wavelength, i.e., coherent light. In order to form diode lasers, facets are formed in the semiconductor structures formed on substrates. The facets form the mirror surfaces of the resonator cavity of the laser diode.

The diode laser device disclosed in Cervantes et al. does not need the roughened top surface or protrusions of the claimed invention because the laser diode does not scatter light, but does resonate light to improve external quantum efficiency.

In reference to Fig. 1 of the present application, reproduced below for the Examiner's convenience with annotation, the roughened surface or protrusions of the claimed invention are formed not on the cleaved side which means that the surface or facet is exposed by scribing and breaking the device to form a single chip, but on the side on which the n-type electrode 52 is formed.



Further, in reference to Figs. 4 and 5 of Cervantes et al., reproduced below for the Examiner's convenience with annotation, Cervantes discloses a laser diode with a cleaved facet (or surface) for forming the mirror surface of the resonator cavity of the laser diode (See column 1 lines 46-48), so the present invention also have the cleave facet of Cervantes by scribing and breaking an epi wafer along the lines 68, 70 indicated in Fig.5 of Cervantes.

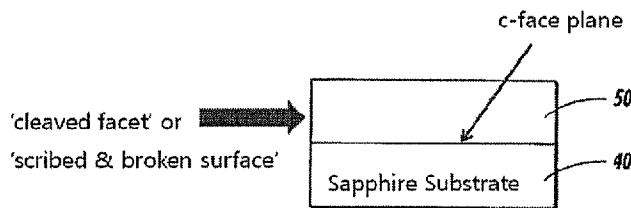


FIG. 4

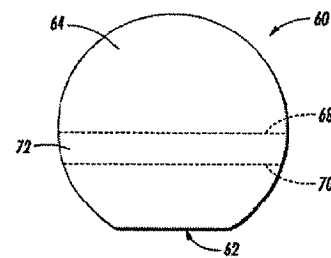


FIG. 5

Again, Cervantes et al. does not teach or suggest **"a top surface of the region for scribing and breaking the device including a roughened surface such that light generated from the active layer escapes outwardly from the device through said roughened surface"** while it discloses a method for cleaving (or scribing and breaking) facets for light-emitting devices comprising such III-V nitride films, formed on c-face sapphire substrates.

The key elements of the claimed invention is the elements of **"a top surface of the region for scribing and breaking the device including a roughened surface such that light generated from the active layer escapes outwardly from the device through said roughened surface."** As indicated in the Office Action, Kwak et al. does not disclose these elements while

it discloses a typical light emitting device including (1) an active layer, (2) an n-type $\text{Al}(x)\text{In}(y)\text{Ga}(1-x-y)\text{N}$ layer and (3) an n-type electrode. Likewise, Cervantes et al. does not disclose any of said key elements of the claimed invention. Cervantes et al. only discloses a method for cleaving (or scribing and breaking) facets for light-emitting devices comprising such III-V nitride films, formed on c-face sapphire substrates. Neither Kwak et al. nor Cervantes et al. nor their combination teaches or suggest **"a top surface of the region for scribing and breaking the device including a roughened surface such that light generated from the active layer escapes outwardly from the device through said roughened surface."**

Therefore, claim 1 is now in condition for allowance.

Claims 2-13

Claims 2-13 depend from the independent claim 1. Thus, the above remarks are equally applicable to claims 2-13. Therefore, claims 2-13 are now in condition for allowance.

As to claims 4 and 5, the Office Action asserts that since Cervantes et al. discloses the roughened surface and a change in size is generally recognized as being within the level of ordinary skill in the art. However, as discussed above, neither Kwak et al. nor Cervantes et al. nor their combination teaches or suggest the top surface of the region for scribing and breaking the device including a roughened surface. As such, the size limitations in claims 4-5 would not be recognized as being within the level of ordinary skill in the art.

As to claim 7, the Office Action asserts that since Cervantes et al. discloses the roughened surface and a change in shape (conical shape) is generally recognized as being within the level of ordinary skill in the art. Again, neither Kwak et al. nor Cervantes et al. nor their combination teaches or suggest the top surface of the region for scribing and breaking the device

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Amendment A

including a roughened surface. Further, the conical shape is not a mere matter of choice because the angle of incidence of light ray would be changed depending on the shape of the protrusions. As such, the conical shape limitation in claim 7 would not be recognized as being within the level of ordinary skill in the art.

In light of the aforementioned amendments and discussion, Applicant respectfully submits that the application is now in condition for allowance.

If any issue regarding the allowability of any of the pending claims in the present application could be readily resolved, or if other action could be taken to further advance this application such as an Examiner's amendment, or if the Examiner should have any questions regarding the present amendment, it is respectfully requested that the Examiner please telephone Applicant's undersigned attorney in this regard.

Respectfully submitted,

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Changhoon Lee
Reg. No. L0316
Husch Blackwell Sanders LLP
720 Olive Street, Suite 2400
St. Louis, MO 63101
314-345-6000
ATTORNEYS FOR APPLICANT